King Saud University
College of Computer and Information Sciences
Department of Computer Science

Course Syllabus
- CSC 311 -

Semester: Spring 2020
Course title: Algorithms Design and Analysis
Credit hours: 3
Instructor: Dr. Fahad Al-Dhelaan (fdhelaan@ksu.edu.sa)
Website: http://fac.ksu.edu.sa/fdhelaan
Office: 2235
Office hours: Check the web site of the course.

Goals of the course: This is an introductory level course in the design and analysis of algorithms. The aim of the course is to provide a solid background in designing and analyzing algorithms. It is hoped that a student will be able to analyze and compare algorithms based on their efficiency, and also design efficient algorithms using several algorithm design paradigms.

Recommended textbooks:
Cormen, Leiserson, Rivest and Stein, Introduction to Algorithms, 3/e, MIT Press, 2014.

Course Learning Outcomes:
Upon the completion of this course, the student should be able to:

- Solve computing problems and acquire the necessary problem solving skills.
- Design efficient algorithms to solve traditional computational problems.
- Analyze time and space complexity of a given algorithm.
- Decide on the hardness of computational problems.
- Design and use common algorithm design paradigm.

Topics (tentative):
Mathematical preliminaries, asymptotic notations, practical complexities, common design techniques and examples: brute force, divide and conquer, greedy algorithms, dynamic programming, graphs, introduction to NP theorem.

Topics	Planned Contact Hours
Introduction + Mathematical essentials	**4**
Growth of functions and asymptotic notations: big-Oh, Big-Omega, Big-Theta.	**8**
Performance analysis of non-recursive algorithms	**4**
Brute force algorithms: Sorting, String Matching, Knapsack, Convex Hull, matrix Multiplication, etc...	**4**
Divide and conquer algorithms: MergeSort, QuickSort, HeapSort, etc..	**8**
Performance analysis of recursive algorithms: Recursive substitution, Recursion tree, Master theorem, etc..	**4**
Graphs: Representation, Traversal, Breadth search first, Depth first search, Minimum spanning tree, Single source shortest path.	**8**
Dynamic Programming: Matrix Chain Multiplication, Longest Common Subsequence, Knapsack, Weighted Interval Job scheduling, Longest increasing/decreasing subsequence, etc..	**8**
Greedy algorithms: Graph Algorithms (Prim's, Dijkstra and Bellman Ford), Job scheduling, Huffman coding, TSP, etc...	**5**
Introduction to NP-Completeness	**3**

Evaluation:

- **Assignments + Tutorials:** 5 marks
- **Group Term Project:** 15 marks
- **Midterm exams (2):** 20 + 20 marks
- **Final exam:** 40 marks

Notes for email communication:

- Your email header must start with *CSC311*
- Send your email to fdhelaan@KSU.edu.sa email address.

- Please write your name and your ID at the end of the email

:Collaboration and attendance policies

- Discussions about the course material are highly recommended. However, the student is not allowed to look at or copy any part of any homework or exam of other students. Plagiarism or any kind of cheating will not be tolerated and a student caught with that will end up having a grade of F.
- A student with an absence rate more than 25% will be denied from attending the final exam. An excuse for being absent for an exam is accepted only if it is legitimate and submitted within one week of the absence date.